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the percentages of new Globes that have occurred from selfing the various mutants and from crossing them reciprocally with normals. The percentage of Globes appears to be somewhat higher than from the main line parents. It is of interest to note that when mutants are used as males in crosses with normals, the percentage of Globe mutations is reduced to about the average expected from the assemblage of main line parents. A comparison of table 3 with table 1, however, will be instructive and lead us to the conclusion that the egg cell is not only more effective in transmitting the mutant character, once it has arisen, but is also more effective in originating these mutations than is the pollen grain.

[1] Blakeslee, A. F. and B. T. Avery, *J. Heredity*, **8**, 1917 (125–131).
[2] Blakeslee, A. F. and B. T. Avery, *Ibid.*, **10**, 1919 (111–120).
[3] Blakeslee, A. F., John Belling and M. E. Farnham, *Science, N. S.*, **52**, 1920 (388–390).

STUDIES OF MAGNITUDES IN STAR CLUSTERS
XIII. VARIABLE STARS IN N. G. C. 7006

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The faintest and most distant variable stars on record have been found on photographs of the globular cluster N. G. C. 7006 made with the 60-inch and 100-inch reflectors at Mount Wilson. The new variables are of considerable value in measuring the size of the galactic system, because they are members of one of the remotest stellar groups now known and serve to determine its distance and dimensions.

The position of the cluster for 1900.0 is:

$$\text{R.A.} = 20^h\,56^m.8, \quad \text{Decl.} = +15^\circ\,48'$$

Its galactic coördinates are:

$$\beta = -20^\circ, \quad \lambda = 32^\circ$$

and its apparent diameter on the Franklin-Adams charts is three-fourths of a minute of arc.

By the usual photometric methods for determining the distances of globular clusters, the parallax of N. G. C. 7006 has been estimated to be:

$\pi = 0''.000015$, from the parallax-diameter correlation.[1]
$\pi = 0.000014$, from photographic magnitude of brightest twenty-five stars.[2]
$\pi = 0.000016$, from photovisual magnitude of brightest thirty-eight stars.[3]
$\pi = 0.000016$, from integrated visual magnitude.[4]

The foregoing accordant results make it fairly certain that N. G. C. 7006 is somewhat more distant than any other globular cluster in the present lists;

but it is now possible with the aid of the variable stars to determine the distance much more accurately.

The following photographs of the cluster have been examined in the stereocomparator for the detection of variable stars.

TABLE 1

PLATE		DATE	TELESCOPE	EXPOSURE TIME
No.	Kind			
4168	S27	1917 Nov. 10.387	60-inch	15^m
5168a*	S30	1919 Dec. 24.284	60-inch	30
5402	S30	1920 July 16.622	60-inch	70
5500	S30	1920 Aug. 10.515	60-inch	50
P 9	S30	1920 Sept. 11.428	100-inch	30
P 23	S30	1920 Sept. 12.381	100-inch	40
P 29	S30	1920 Sept. 12.556	100-inch	30
5601	S30	1920 Sept. 14.312	60-inch	45
P 50	S30	1920 Sept. 15.379	60-inch	60

*Plate 5168a was made by Mr. Hoge, the others by Mr. Shapley.

TABLE 2

STAR	*X*	*Y*
1	—177″.6	+113″.8
2	—38.0	—38.0
3	—27.6	+32.8
4	—24.2	—42.2
5	—24.2	+36.2
6	—15.5	—44.8
7	0.0	—38.0
8	+31.0	+13.8
9	+36.2	+15.5
10	+38.0	—13.8
11	+141.4	+48.3

Seven of the eleven variables found on the above plates show conspicuous variation in the course of one night, and the other four appear also to be short period variables. In magnitude and range they are very much alike, and in this cluster, as in Messier 3, ω Centauri and other systems, the variables are between one and two magnitudes fainter than the brightest stars. It is probably safe to assume, therefore,that these faint variable stars are typical short-period Cepheids, similar to those commonly found in globular clusters.

The coördinates of the variable stars, referred to the center of the cluster, are given in seconds of arc in table II. Nos. 2 and 5 were found or suspected by Miss Ritchie, the others by Miss Mayberry.

From fifty-three measures of the brightness of the eleven variable stars on the plates made with the 60-inch reflector, a median magnitude of 18.96 is found. The median for the seven that appear most certainly to be short period Cepheids is also 18.96. The photographic magnitudes[4] of the variables are based on the results for the bright stars of the cluster, published in *Mt. Wilson Contr.*, No. 156, p. 4, 1918.

The observed range in photographic magnitude for the eleven variables is 0.83; for the seven variables it is 0.99.

If we adopt from *Mt. Wilson Contr.*, No. 151, the value —0.23 as the median photographic absolute magnitude of short period Cepheids, we have $m - M = 19.2 = 5 (\log d - 1)$, from which the distance, d, is found to be 69,000 parsecs. Expressed as a parallax, this is 0″.0000145—a highly satisfactory confirmation of the former results.

Although N. G. C. 7006 is the smallest known cluster in angular diameter, its linear dimensions are comparable with those of Messier 13. The diameter probably exceeds 300 light years, since two of the variables are more than 170 light years distant from the center of the cluster.

It is of interest to recall that the study of the brightest stars in N. G. C. 7006 has shown no effect of selective scattering of light in space. It also appears, from the agreement of the parallax based on angular diameter with the values based on magnitude methods, that the general non-selective absorption of light is inappreciable in the direction of N. G. C. 7006, even when the distance involved is, as in this case, 225,000 light-years.

[1] *Mt. Wilson Contr.*, No. 152. p. 13, 1917; *Astroph. J. Chic.*, **48**, 1918 (166).

[2] *Mt. Wilson Contr.*, No. 152, p. 14, *n*-1, 1917; *Ibid.*, **48**, 1918 (167).

[3] *Mt. Wilson Contr.*, No. 156, pp. 1–6, 1918; *Ibid.*, **49**, 1919 (249–54).

[4] *Mt. Wilson Contr.*, No. 161, pp. 16–18, 1918; *Ibid.*, **50**, 1919 (122–4).

THE SKIN TEMPERATURE OF PACHYDERMS

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A knowledge of the temperature of the skin is of great assistance in interpreting the laws governing the loss of heat from the animal organism, but with warm-blooded animals, such as birds and many mammals, the skin temperature is determined only with difficulty, because of the covering of hair or fur. With humans, also, the protective clothing interferes with the accurate determination of skin temperature, for numerous observations have shown that even under ordinary clothing the skin temperature of man is by no means constant and, due to the protective covering, is undoubtedly much higher than it would otherwise be. It seemed, therefore, that records of the skin temperature of certain hairless animals would be of value, since the factor of covering would thus be eliminated. Accordingly, we took advantage of the excellent material at the New York Zoological Park and of the friendly coöperation of Mr. Raymond L. Ditmars to make such observations, and as a result are able to report the surface temperatures of two elephants, one rhinoceros, and a hippopotamus, all presenting large hairless surface areas.

The method employed was that described in an earlier communication.[1] The apparatus consists of two copper-constantan thermo-junctions, with special means of application to the skin to secure the true skin temperature rather than the resultant of skin and environmental temperature. One junction is kept in a thermos bottle with a carefully calibrated thermometer, which is read practically every minute or two, and the other junction applied to the skin. The difference in temperature between the two junctions is noted on a galvanometer, whose "constant" is likewise checked every few minutes.